TEL1-PCM-HS-BATT

User Manual

Digital High Data Rate Telemetry System for Strain Gage and ICP Applications on Rotating Shafts

"Gain and Auto Zero setting direct from Receiver Side!"

- **Easy to assemble and operate**
- **For strain gages or IPC sensors**
- **Strain gage sensors (>350 Ohm)**
- **Full- and half bridge configuration**
- **Excitation fixed 4 Volt DC**
- **Auto-Zero adjustment - Setting receiver side**
- **Gain: 250-8000 - Setting receiver side**
- **External shunt calibration**
- **ICP current 4mA, Gain selectable to: 2-4-8-16**
- **Digital transmission realized inductively**
- **Distance up to 50mm**
- **No influence through radio frequency**
- **Many systems can operated at the same time**
- **Signal bandwidth 0…50kHz** (Scanning rate 104kHz)
- **Output +/-10V and digital for interface (Option)**
- **System accuracy <0.2%**

INSTRUCTIONS FOR QUALIFIED PERSONNEL ONLY!

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General Description

The TEL1-PCM-HS-BATT single-channel high data rate telemetry system offers the easiest handling for the wireless transmission of strain gage signals from rotating shafts. The encoder 62x27x13mm with a weight of 30g. The transmitter (encoder) part is simply mounted on the rotating shaft with a special fiber reinforced tape.

Powering of the transmission part is via battery 6-9V or optional inductive power supply. The digital data transfer between transmitter and receiver is realized inductively.

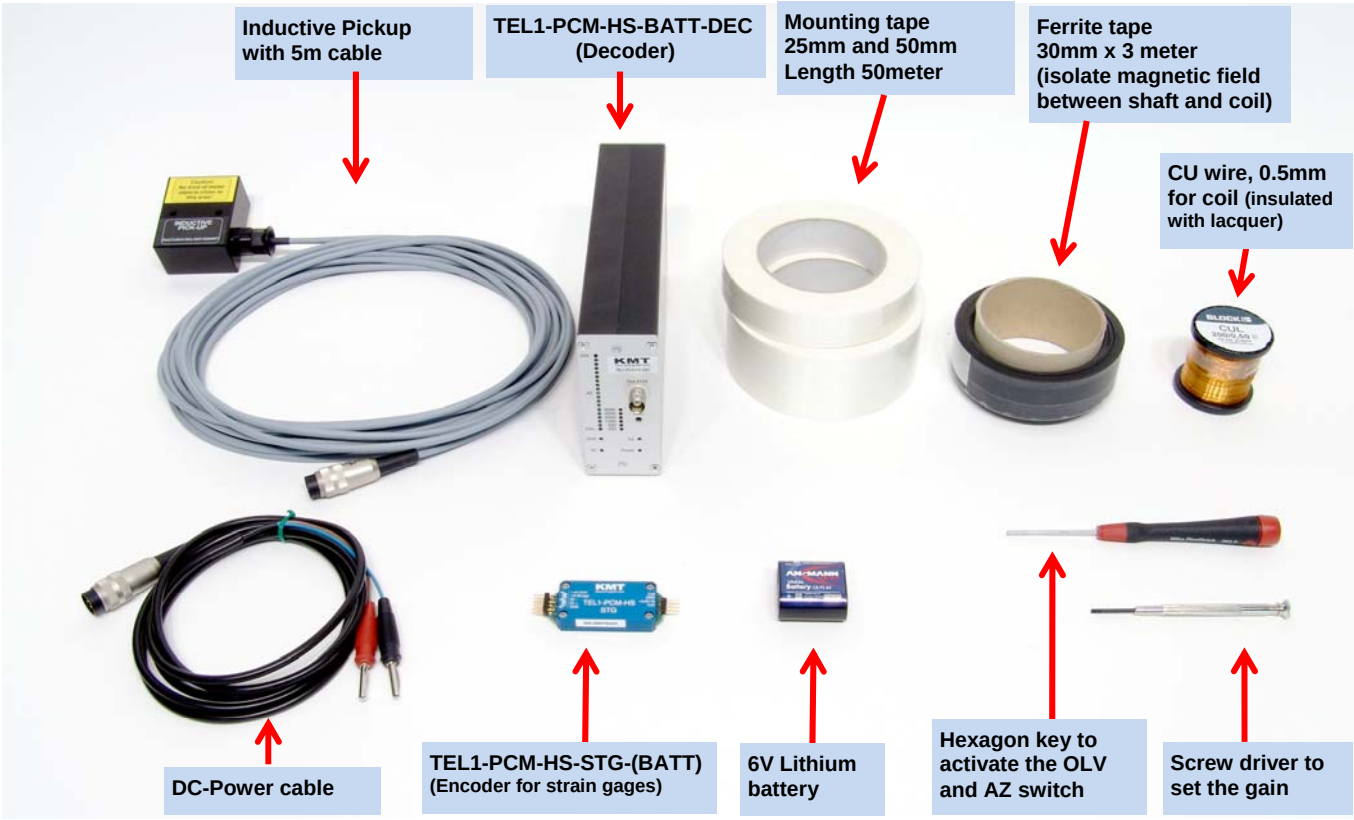
Functional Description

The TEL1-PCM-HS-BATT transmitter provides a pulse code modulated signal (PCM) to an induction winding around the *shaft (max. diameter 500mm, other on request!)*. The magnetic field of this winding enables the inductive transmission of the signal to the pickup coil. From there the signal is transferred by cable (5 m) to the receiver. The maximum distance between the transmitter coil and the pickup is 50mm. (with standard head)

The receiver unit offers a BNC connector at the front panel with analog outputs ± 10 V and a optional a digital output for PCM interface ECIA100 (for notebooks) or IF16 (PCI Desktop). An LED bar indicator shows the actual level and a successful Auto Zero calibration. Overload is indicated by the last LED´s in pos. or neg. direction of the bar graph. These OVL-LED´s operate in peak-hold mode and are reset by pressing the overload switch.

Strain gage sensors (>350 Ohm) in full- and half- bridge configuration can be directly connected to the transmitter. The excitation is fixed to 4 Volt DC and the gain is set by the gain switch on the receiver side. An auto-zero (AZ) adjustment is executed by pressing the AZ button on the front side of the receiver. The successful AZ operation is indicated by a yellow LED in the middle of the LED bar indicator. When the AZ completes the LED continuously illuminates. A continued flashing of the yellow LED indicates some error in the AZ electronics. In this case please contact the support of KMT. Additional to the AZ you have the possibility to calibrate the bridge by external shunt. (+ and -). The AZ setting is stored in a Flash-RAM and thus is not lost during power-off. Use only shielded sensor cable.

TEL1-PCM-HS-BATT set contains:


Inductive Pickup with 5m cable
TEL1-PCM-HS-BATT-DEC (Decoder)
Mounting tape 25mm and 50mm Length 50meter
Ferrite tape 30mm x 3 meter (isolate magnetic field between shaft and coil)
CU wire, 0.5mm for coil (insulated with lacquer)
DC-Power cable
TEL1-PCM-HS-STG-(BATT) (Encoder for strain gages)
6V Lithium battery
Hexagon key to activate the OLV and AZ switch
Screw driver to set the gain

Technical Data - rotating part

TEL1-PCM-HS-BATT-STG
Strain gage: Full and 1/2 bridge >350 Ohm,
Excitation: 4 VDC (fixed)
Gain: 250; 500; 1000; 2000; 4000; 8000 (selectable from receiver side)

Gain and STG-Sensitivity (output +/-10V at decoder)	
Gain 250 = +/-5mV/V	**Gain 2000 = +/-0.650mV/V**
Gain 500 = +/-2.5mV/V	**Gain 4000 = +/-0.3125mV/V**
Gain 1000 = +/-1.250mV/V	**Gain 8000 = +/-0.15625 mV/V**

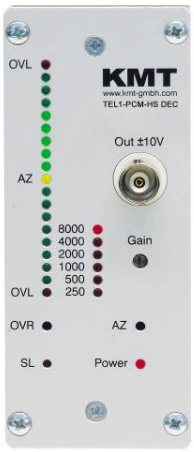
Shunt Cal: Via external resistor for positive and negative calibration
AZ: Auto Zero calibration (selectable from receiver side)
Analog signal bandwidth: 0 - 50 kHz (-3 dB)
Scanning rate 104 kHz
Operating temperature: - 10 to + 80 °C
Dimensions: 62 x 27 x 13mm (without connectors)
Weight: each module 30 grams
Static acceleration: up to 3000g
Powering: Battery 6-9V, Power consumption 70mA at 6V
Optional additional inductive powering

TEL1-PCM-HS-BATT-ICP
For all ICP sensors
Curren: 4mA (fixed)
Gain: 1; 2; 4; 8; 16; 32 (selectable from receiver side)

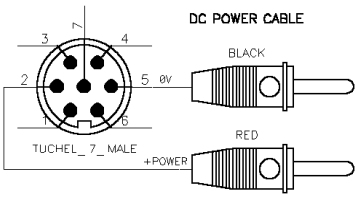
Gain	Resolution
250 = 1 **at ICP**	12 bit
500 = 2 **at ICP**	12 bit
1000 = 4 **at ICP**	12 bit
2000 = 8 **at ICP**	12 bit
4000 = 16 **at ICP**	12 bit
8000 = 32 **at ICP**	11 bit

Analog signal bandwidth: 3 - 50000 (-3 dB)
Scanning rate 104 kHz
Operating temperature: - 10 to + 80 °C
Dimensions: 62 x 27 x 13mm (without connectors)
Weight: each module 30 grams
Static acceleration: up to 3000g
Powering: Battery 6-9V, current consumption 80mA at 6V
Optional additional inductive powering

Technical Data - static part



Front Rear



TEL1-PCM-HS-BATT-DEC

Front side:

Analogue output: +/-10V via BNC
Digital output for PCM Interface IF16 (ECIA100) OPTION
Gain setting : via screw switch
Auto Zero setting: via micro switch
Overload LED's (Red ON) reset: via micro switch
Green LED's: Bargraph +/-
Autozero LED:
Yellow ON- successful AZ
Yellow OFF- not successful AZ
if flashing, call support of KMT, error in EPROM
Green LED's: Bargraph +/-
SL LED: Red ON = if error of data transmitting
SL LED: Red Flashing = if distance to far
Power ON LED: Red ON = if power switch on

Rear side:

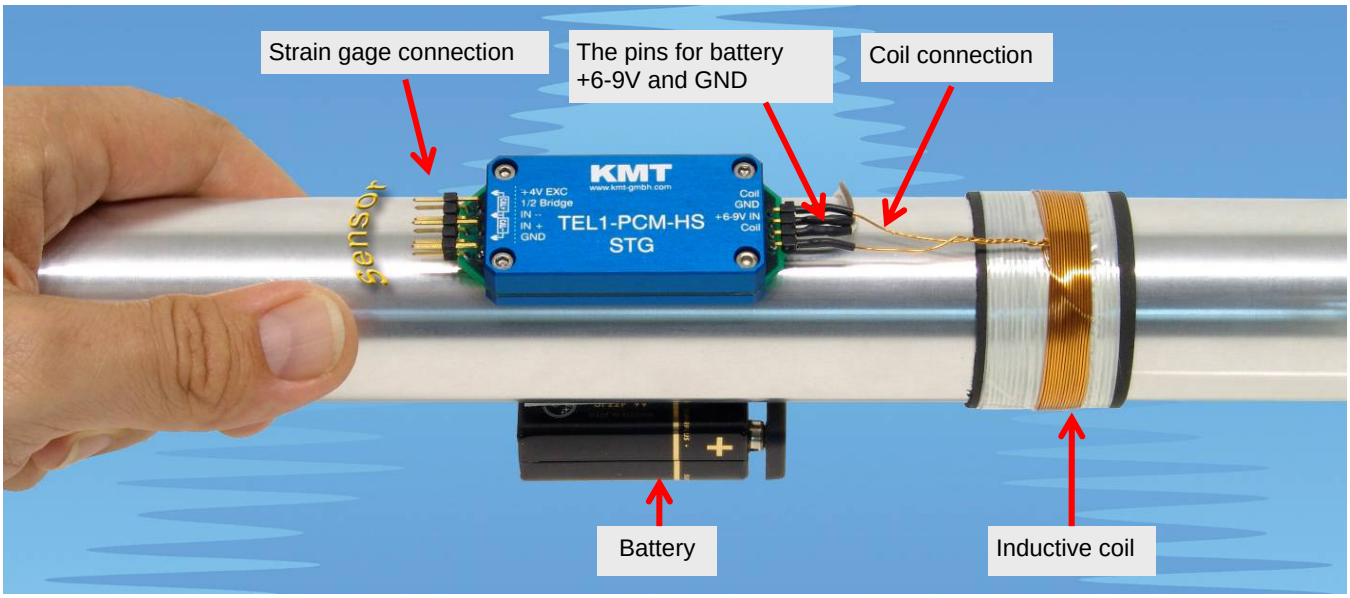
Output to Powerhead: via 5pol. Tuchel
Fuse LED: Flashing if fuse is defect
Powering: 10-30V DC, Input via 7pol. Tuchel
Switch: ON/OFF

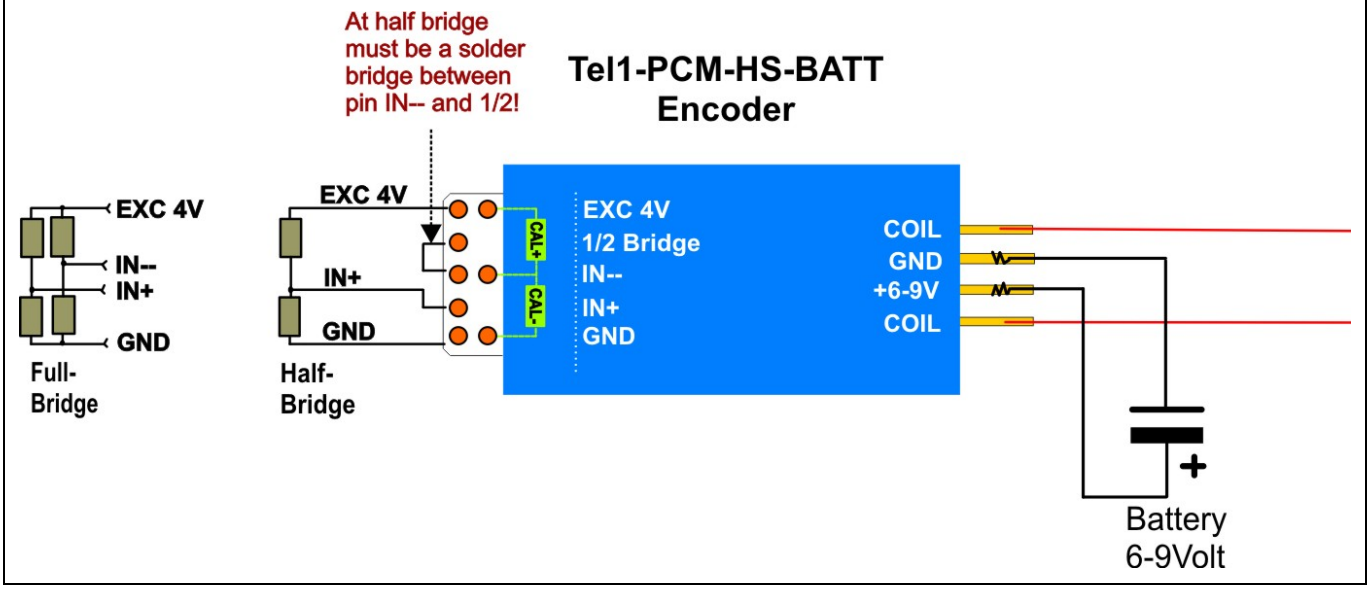
Operating temperature: - 10 to +70 °C
Dimensions: 200 x 105 x 44 (without connectors!)
Weight 950 grams
Static acceleration: up to 200g
System accuracy (without sensor): +/- 0.2 %

TEL1-PCM-HS-Pickup

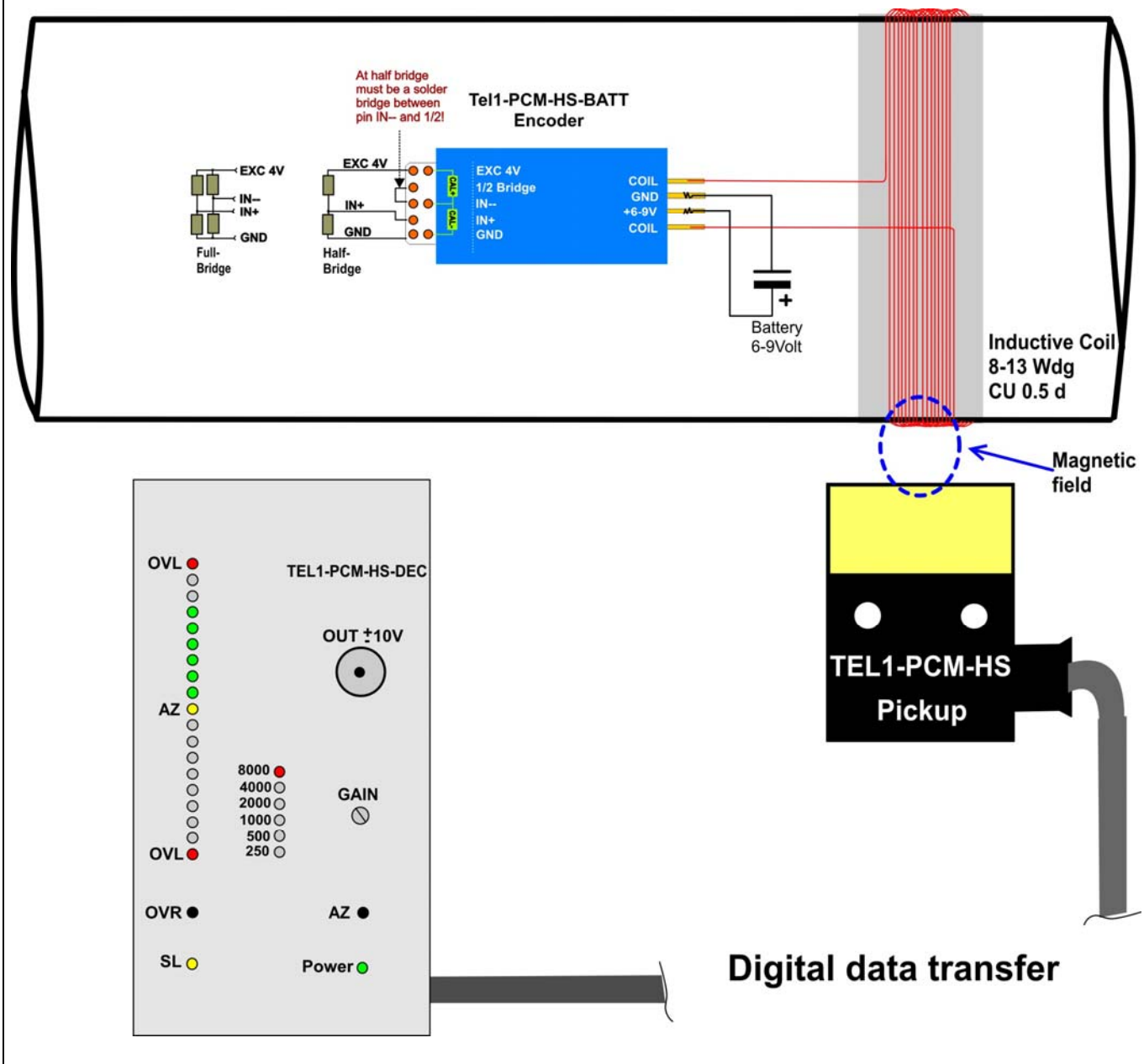
Function: Receiving inductive magnetic field in PCM modulated code
Distance between the transmitter coil and the pickup is 50mm
Output to TEL1-PCM-HS-BATT Decoder via 5pol. Tuchel plug incl. 5m cable. Cable length standard 5m, optional 20m
Operating temperature: - 10 to +80 °C
Dimensions: 45x60x25mm (without cable)
Weight: 400 grams (with 5m cable!)
Housing: splash-water resistant IP65 (except connector).

Transmitting Part:





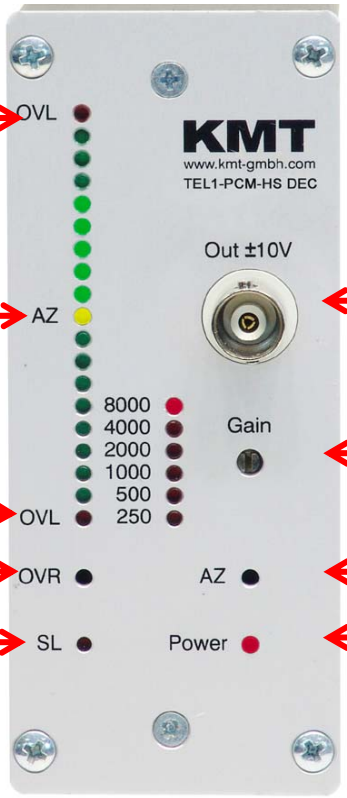
Block diagram:



Note: The Powerhead must be fixed in the middle of the coil in a distance from 5 up to 50 mm.

Receiving Part:

Front



Positive Baragraph LED
With overload indicator

Auto Zero LED
ON = successful
OFF = Not successful

Negative Bargraph LED
With overload indicator

Reset button of
overload indicator

LED ON = Error data transmission
LED Flashing = Battery voltage lower 6V

Analog output +/-10V

Gain switch

AZ button

Power On LED

Rear

Flashing if fuse damage

Data input from Pickup head

PCM OUT for Interface
(Option!)

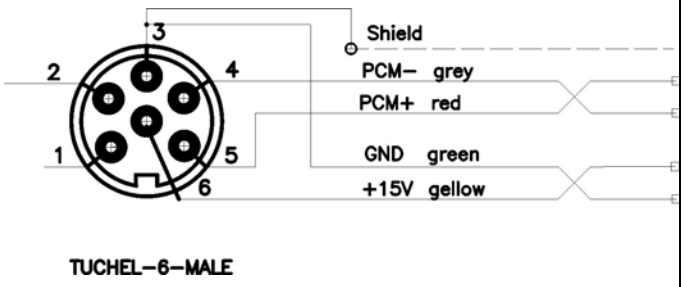
Power ON/OFF switch

Power In DC 10 – 30V

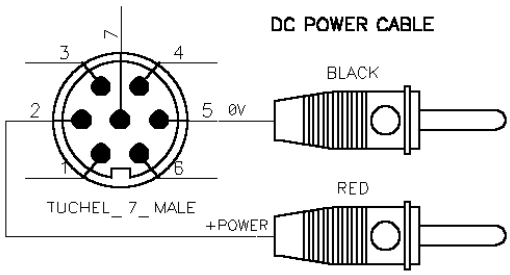
Pin connection cable:

Pickup

Distance of 5-100mm



DC-Power cable



Shaft Installation

Mount 2 layers of the special ferrite tape around the shaft. (each layer seperatly, without overlap!)

1.)

Fix with 2 layers of mounting tape around the shaft

2.)

3.)

Coil, depends of shaft diameter 4-25 parallel windings of 0.5 CUL wires (see table for help)

4.)

5.)

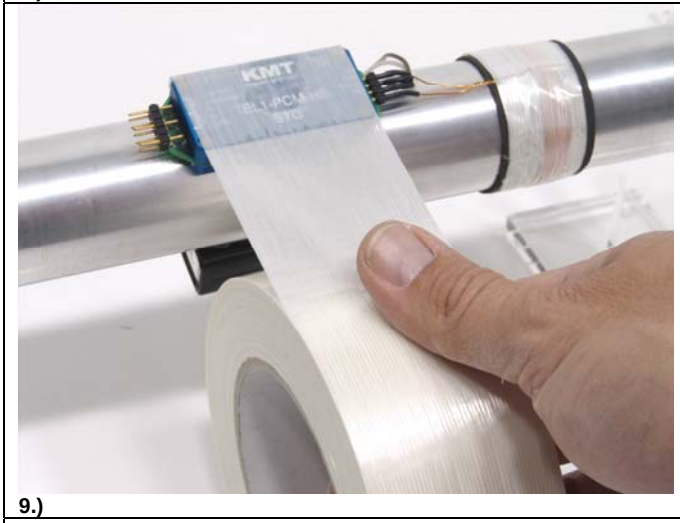
Fix with 3-4 layers of mounting tape around the shaft

6.)

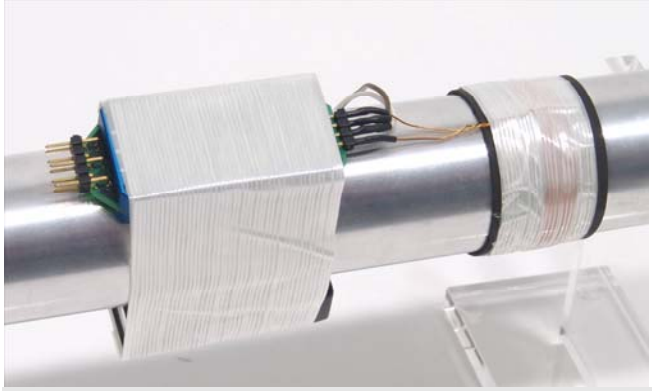
7.)

Solder the wires of the coil on the pins of TEL1-PCM-HS-STG "2x Coil"

8.)



9.)



10 layers of the special mounting tape (width 50mm) around the shaft.
We recommend add. use a steel hose clamp for final fixing!!

10.)

steel hose clamps

Caution:

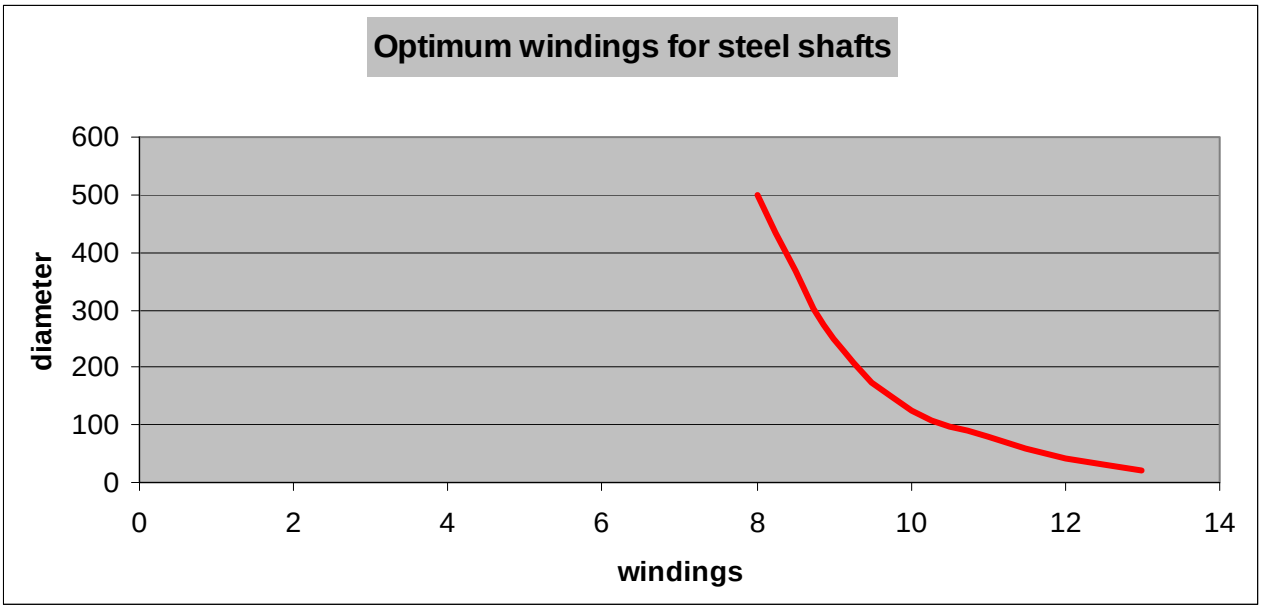
Fix TEL1-PCM-HS-STG-BATT module with at least 10 layers (width 50mm) of the special mounting tape around the shaft. Depending on the shafts RPM and diameter particular attention needs to be paid to the safe mounting of the components.
The manufacturer doesn't accept liability for damages, which results from insufficient attachment of the individual components.
The tape is only for test purposes, in order to test the electrical function of the units in the idle state of the shaft.

During the rotation test appropriate safety precautions should be taken.
The entire installation may be used only by authorized persons. By using tape for the attachment, it has to be used in the direction of rotation of the shaft and the end has to be secured. Only non-elastic tapes with high tensile strength should be used for pre-fixing. Additionally, use a steel hose clamp for final fixing!! The individual components are to be distributed in such a way on the shaft that imbalances are avoided.

Find the correct amount of windings

The number of windings depends on several factors. The most important influential factors are the diameter, the materiel of the shaft and the environment around the shaft. The table standing below will help you to find the right number windings for steel shafts. The table below is a help to estimate the number of windings fast. To optimize your results you can try one winding more or less.

Coil, depends of shaft diameter 4-25 parallel windings of 0.5 CUL wire



Windings	Diameter (mm)
8	600
8	500
9	250
10	125
11	80
12	40
13	20

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Konformitätserklärung

Declaration of Conformity
Declaration de Conformité

Wir We Nous	**KMT - Kraus Messtechnik GmbH**
Anschrift Address Adress	**Gewerbering 9, D-83624 Otterfing, Germany**

erklären in alleiniger Verantwortung, daß das Produkt
declare under our sole responsibility, that the product
declarons sous notre seule responsibilité, que le produit

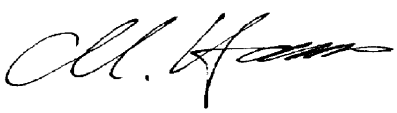
Bezeichnung Name Nom	**Messdatenübertragungssystem**
Typ,Modell,Artikel-Nr., Größe Type,Model, Article No.,Taille Type, Modèle, Mo.d'Article,Taille	**TEL1-PCM-HS-BATT**

mit den Anforderungen der Normen und Richtlinien
fulfills the requirements of the standard and regulations of the Directive
satisfait aux exigences des normes et directives

108/2004/EG	**Elektromagnetische Verträglichkeit EMV / EMC** DIN EN 61000-6-3 Ausgabe 2002-8 Elektromagnetische Verträglichkeit EMV Teil 6-3 Fachgrundnorm Störaussendung DIN EN 61000-6-1 Ausgabe 2002-8 Elektromagnetische Verträglichkeit EMV Teil 6-1 Fachgrundnorm Störfestigkeit

und den angezogenen Prüfberichten übereinstimmt und damit den Bestimmungen entspricht.
and the taken test reports und therefore corresponds to the regulations of the Directive
et les rapports d'essais notifiés et, ainsi, correspond aux règlement de la Directive.

Otterfing, 27.04.2006 **Martin Kraus**



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Ort und Datum der Ausstellung Place and Date of Issua Lieu et date d'établissement	Name und Unterschrift des Befugten Name and Signature of authorized person Nom et signature de la personne autorisée

KMT - Kraus Messtechnik GmbH

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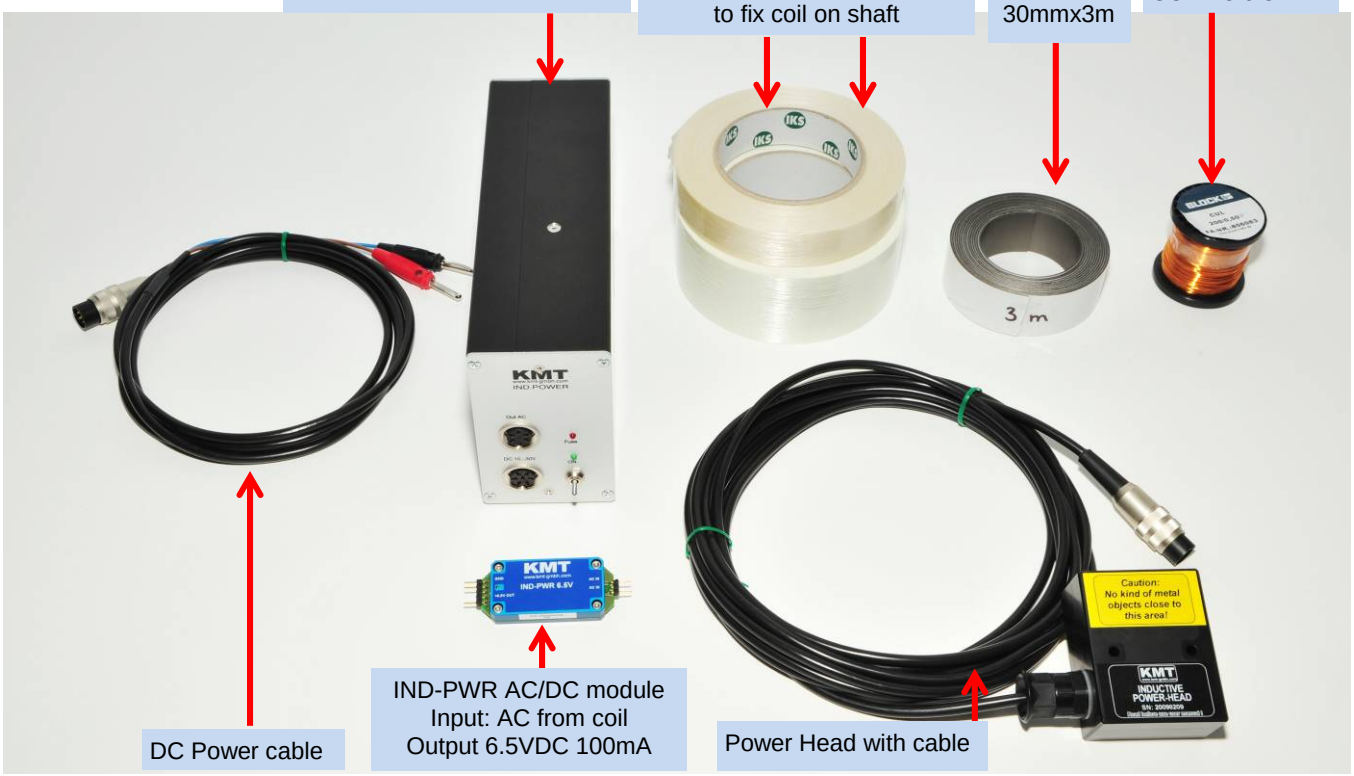
Inductive power supply

Assembling instructions for TEL1-PCM-HS-BATT

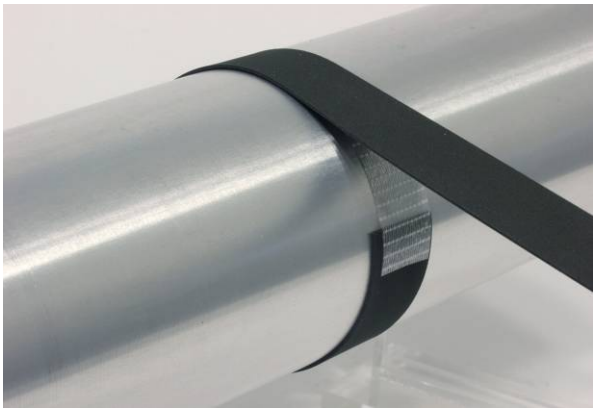
Inductive power supply set

Picture shows standard Inductive Power Supply for diameter up to 300mm

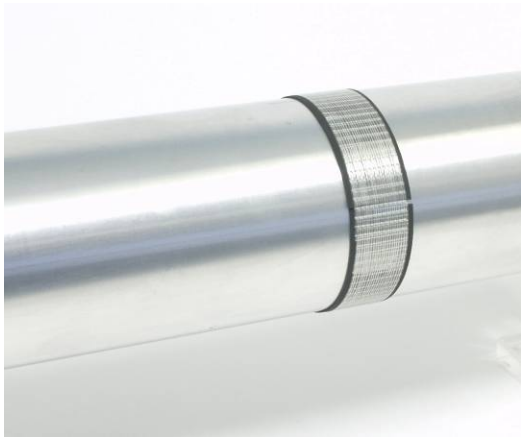


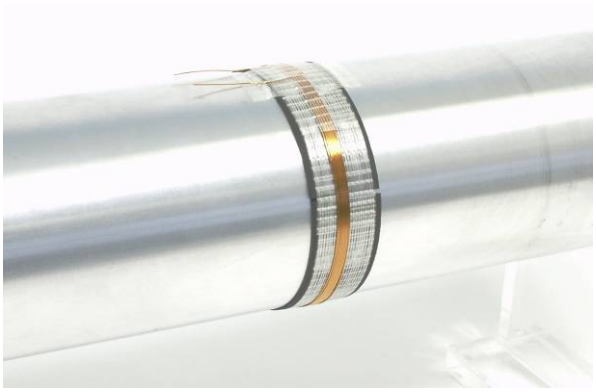
Mounted on shaft

Installation of coil for inductive powering on shaft



Attach for electromagnetic insulation “Ferrite Tape”
- 2 x layers Ferrite-Tape around the shaft
- Fixed with 2 layers mounting tape





Wind the 0.5 mm enameled copper wire around the shaft:

- 4-25 windings for 500-20mm diameter

Other diameter on request!

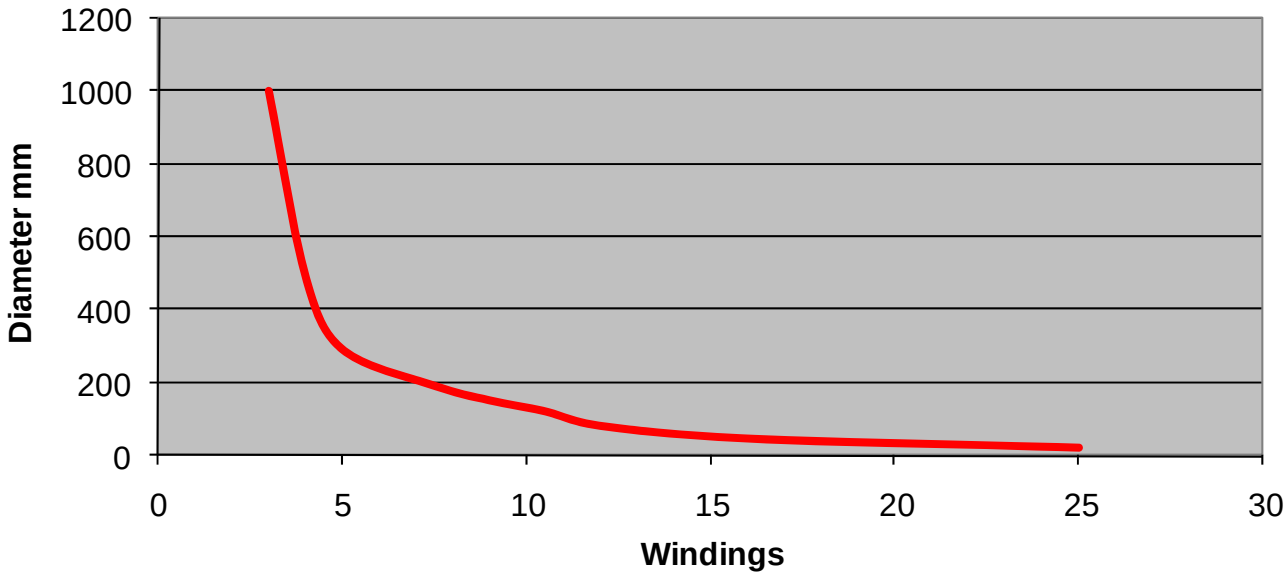
<u>Note:</u> “The inductive load of the IND-PWR AC/DC module and the capacitor in the Power Head must be in resonance to get the optimal transmission. The inductive load of the shaft depends of diameters, material and number of windings. ”

To find the optimal transmission try one winding more ore less. The LED on the Inductive Power module will help to find the best configuration. The distance between powerhead and the coil is 3-10mm.

Control the output voltage and move the powerhead in the max distance to the coil.
The minimum Output voltage must be 6,5 V!

Fix all with 2-3 layers around the coil with mounting tape.

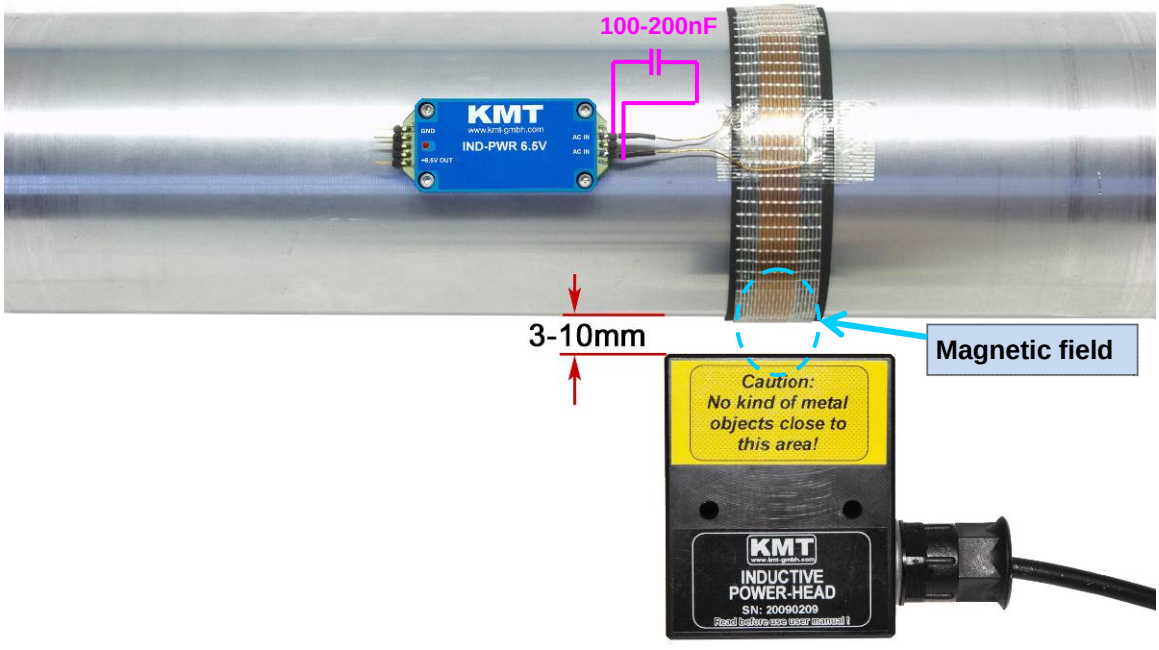
Optimum windings for steel shafts

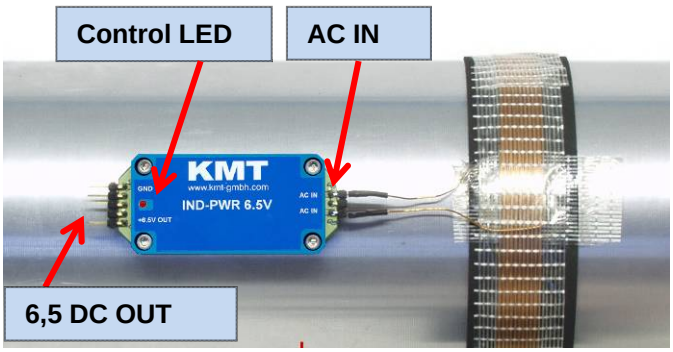


Diameter (mm)	Windings	Fine adjustment capacitor parallel to coil
1000	4-5	100-200nF (Type MKT or MKS 250V)
490	4-5	100-200nF (Type MKT or MKS 250V)
290	5	100-200nF (Type MKT or MKS 250V)
190	7	---
150	9	---
120	10	---
80	12	---
45	16	---
20	25	---

We recommend a capacitor decade e.g

100pF .... 11,111 µF

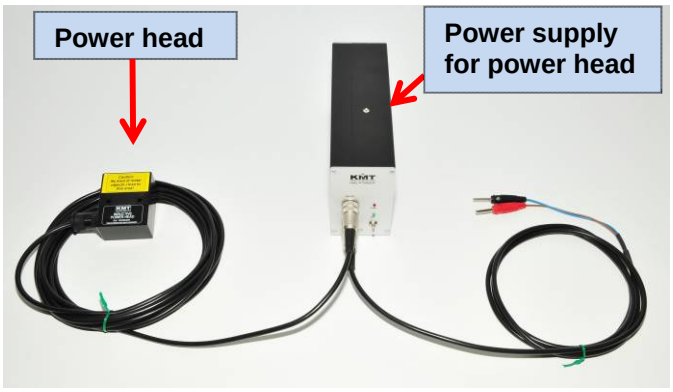




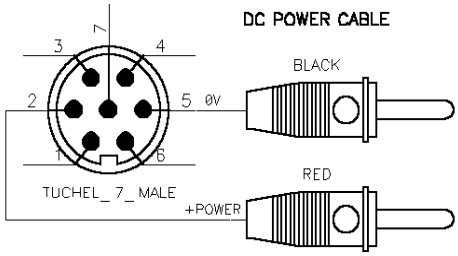
The pins “AC IN” are the AC power input from the coil. On the pins “+6.5” and “GND“ you get a stabilized output voltage of 6.5V DC. The control LED will lights up, as soon as the power head is switched on and at the right position - close enough to the coil on the shaft. The max. load current on the DC output is 100mA. The AC/DC converter will use instead battery pack!

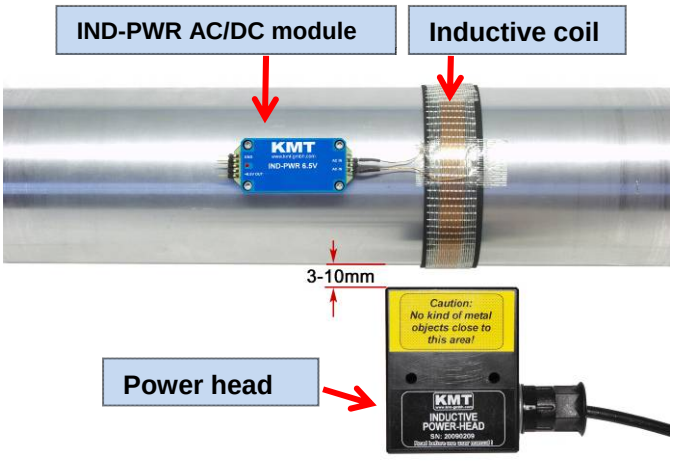
Never use any battery together with the IndPwr!´

Installation of the power head for inductive powering



Connect the power head on the “AC Out” socket of the power box and then the DC power cable on the “DC In 10-30V” socket. The two banana plugs have to be connected to a DC power source with red on +10-30V DC and **black** on **0V**.





You should mount the power head at a fixed location that it’s as free as possible from vibration influences.

The center of the coil should be in the same horizontal position as the center of the power head. The distance is optimal in the range between 3 and 10mm. (depends of shaft and current consumption)

If the red LED of the AC/DC converter lights up, the position of the power head is OK.

Fixing of IND-PWR AC/DC module and TEL1-PCM-HS-BATT

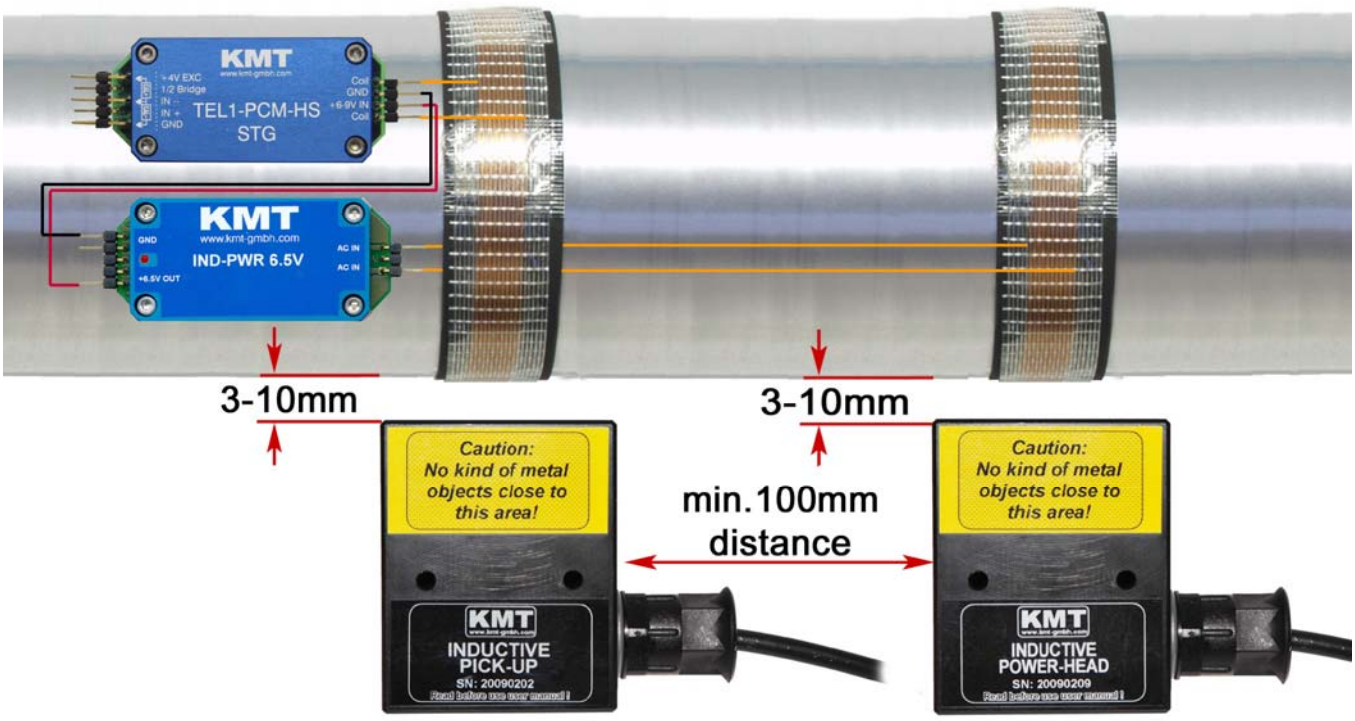
Fix all modules with at least 10 layers of the special mounting tape around the shaft.
According to the shafts RPM and diameter it's particularly paid attention to safe mounting of the components.
Add. use hose clamps for final fixing!!

The manufacturer doesn't accept liability for damages, which results from not sufficiently attachment of the individual components. The provided cable harness and the tape are only for test purposes, in order to test the electrical function of the units in the idle state of the shaft.

During the rotation test appropriate safety tools are to be attached.

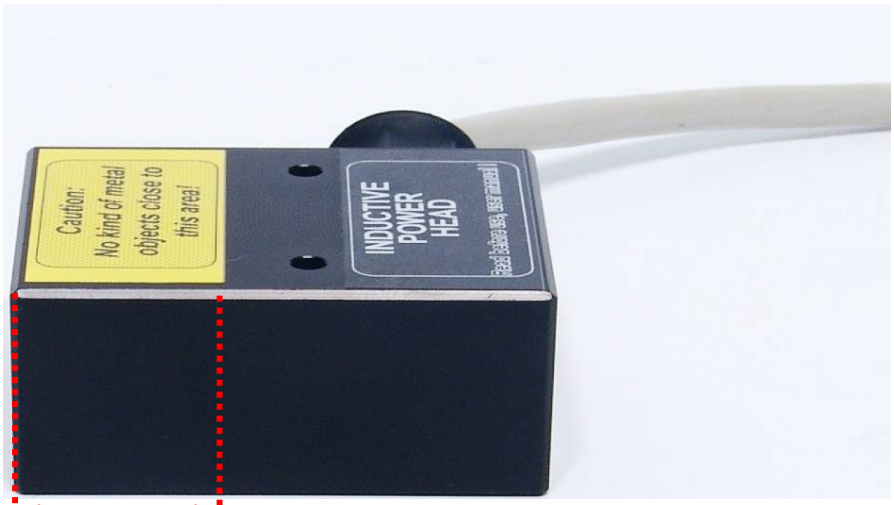
The entire installation may be used only by authorized persons. By using tape for the attachment, it has to be used in the direction of rotation of the shaft and the end has to be secured against removing. Only non-elastic tapes with high tensile strength have to be used for pre-fixing. **Add. use hose clamps for final fixing!!**
The individual components are to be distributed in such a way on the shaft that imbalances will avoid.

Connection IND-PWR AC/DC module and TEL1-PCM-HS-BATT



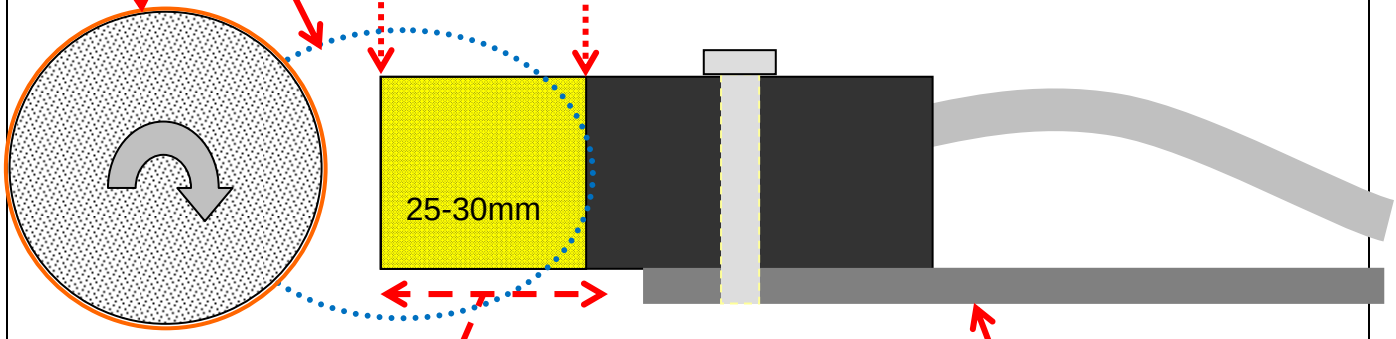
To avoid transmitting error, the **mounting distance** between **Inductive Power Head** and **Inductive Pickup Head** must be at least **100mm**.

Following must be considered at the mounting of the inductive power head



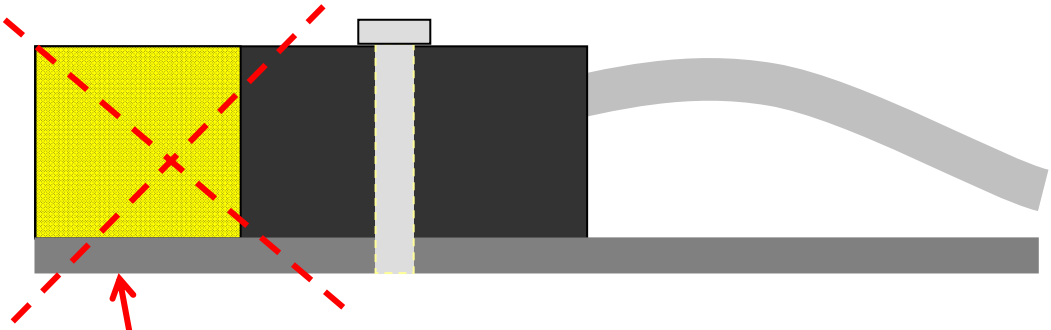
Shaft with Cu wire Coil

Magnetic field



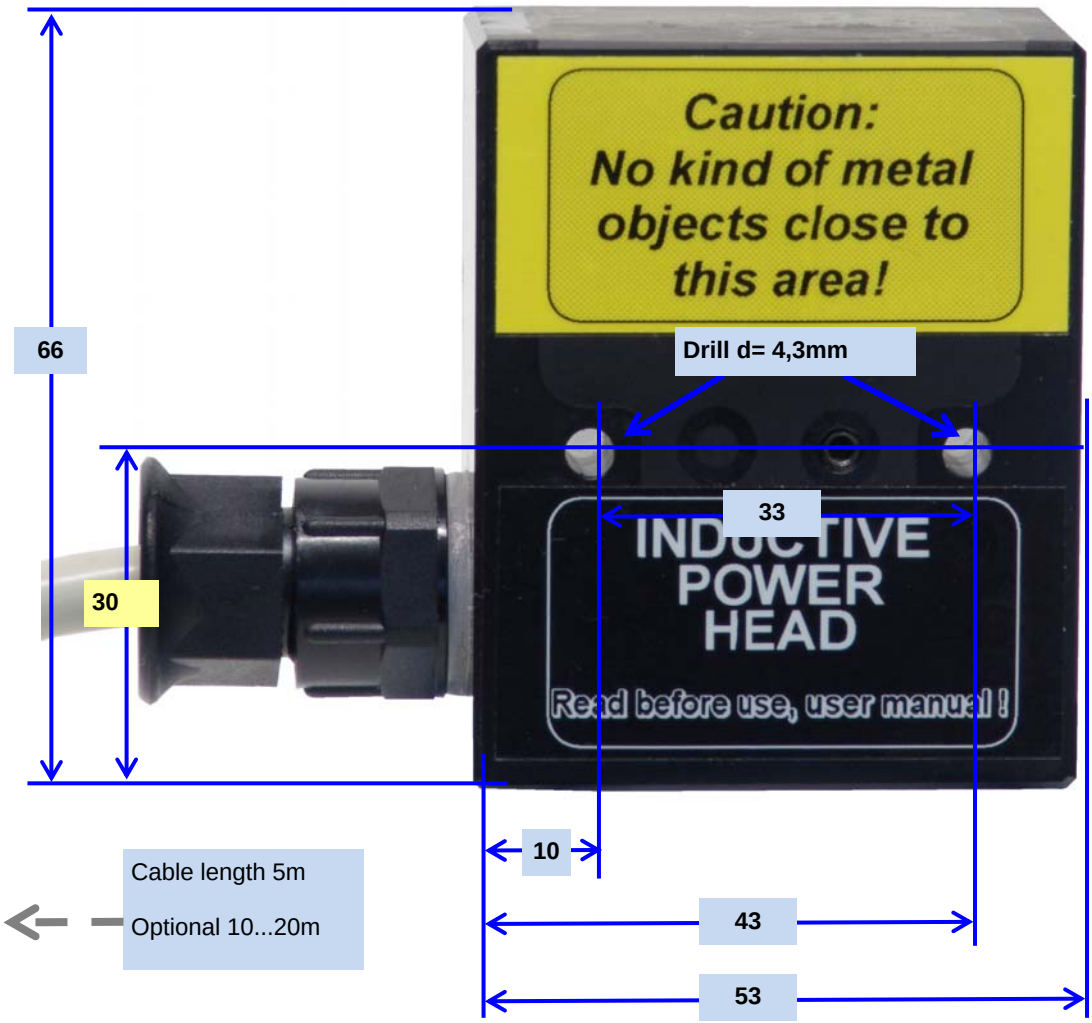
Don't use for mounting any kind metal in this area (25-30mm)! Otherwise flow magnetic energy in the metal also and degrease the distance between power head and coil (on shaft)!

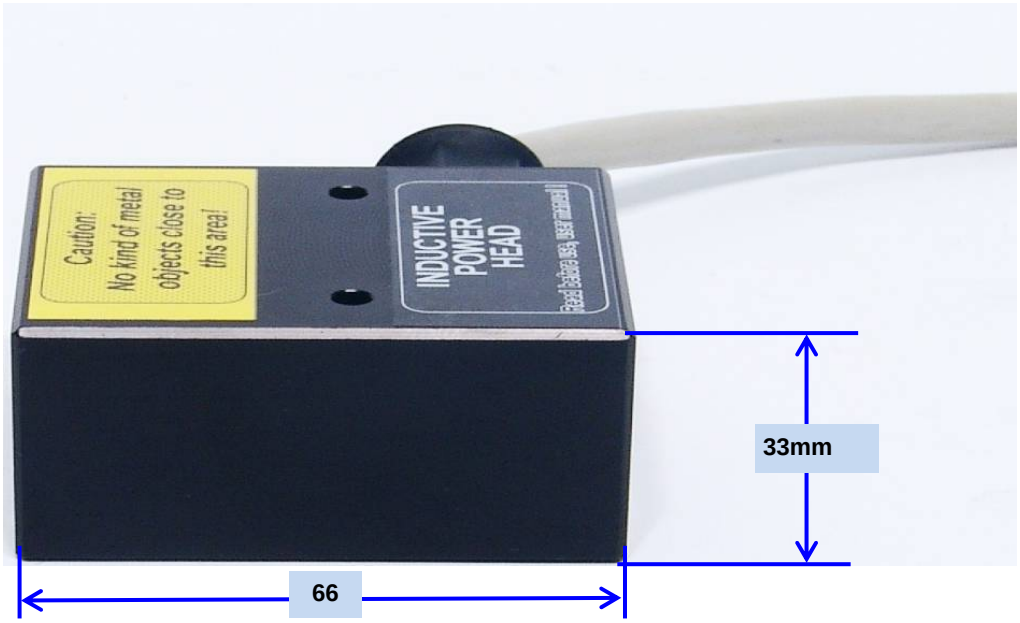
Example of mounting plate,



Wrong!!! Mounting plate cover the active area of inductive head

Dimensions Powerhead





Attention

- Use only shielded sensor cable
- When used on rotating shafts, all connections must be soldered.
- Mounting of the modules on a shaft must be first fixed with mounting tape (only for prefixing) and then with a hose clamps!!!

Safety Notes for Inductive Powering

- The device should only applied by instructed personnel.
- The power head emits strong magnetic radiation at 60 kHz to a distance of 20 cm. Therefore persons with cardiac pacemakers should not work with this device!
- Magnetic data storage media should be kept in a distance of at least 3m from the power head to avoid data loss. The same is valid for electromagnetic sensitive parts, devices and systems.
- Do not place the power head in the switched-on state on metallic objects, because this results in eddy currents, which could overload the device and strongly heat up small objects. In addition, the probe could be destroyed!
- No metallic objects, other than the disc-type coil, should be located in the air gap of the power head. The same applies to metallic parts within a radius of up to 15–20 mm in all directions.
- Do not use damaged or faulty cables!
- Never touch in the area between shaft and inductive head, the rotating shaft itself or rotor electronic contacts during operation!
- This is a “Class A” system suitable for operation in a laboratory or industrial environment. The system can cause electromagnetic interference when used in residential areas or environments. In this case the operator is responsible for establishing protective procedures.